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The Binding of Carboxylates to ZnO Surfaces

Andrew Pohlman

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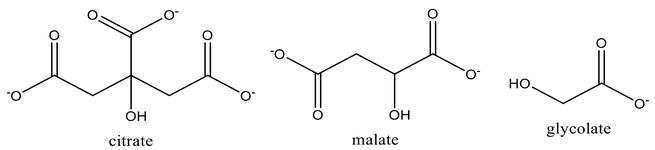
Andrew Pohlman (’10), Dr. Simon Garcia

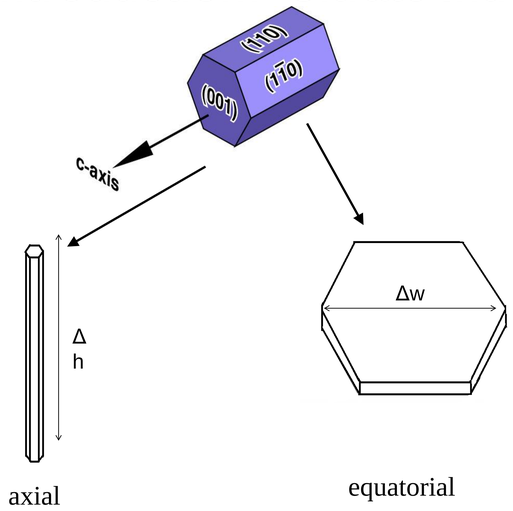
Abstract

ZnO powder was exposed to the surface modifiers citrate, malate, and glycolate in aqueous solutions and then suspended in iso-propanol in order to obtain ATR-IR spectra. These spectra were used to make a qualitative comparison of the relative amounts of surface modifier bound to the ZnO surface. The presence of iso-propanol inhibits the binding of carboxyl-group based surface modifiers while the presence of water enabled or enhanced the binding of the surface modifiers to the surface of ZnO. The structure of the surface modifiers were systematically changed by number of carboxyl groups on the surface modifier contained. The more carboxyl groups the surface modifier had, the more likely it is to bind to the surface of ZnO.

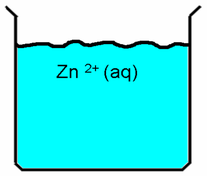
Surface Modifiers



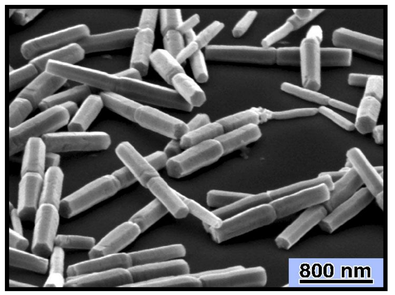
Introduction: Citrate Induces Changes in Crystal Shape

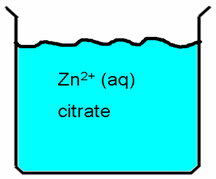


ZnO crystals can grow in the axial or equatorial plane.

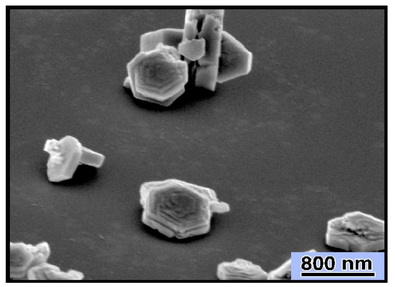


Without citrate, ZnO crystals are elongated and rod-like



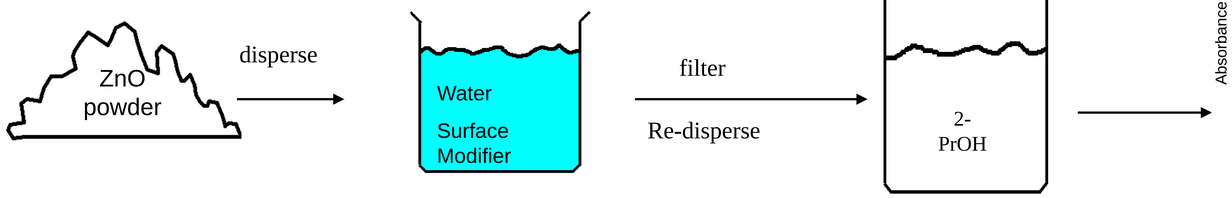


In the presence of citrate, ZnO crystals are flat and plate-like

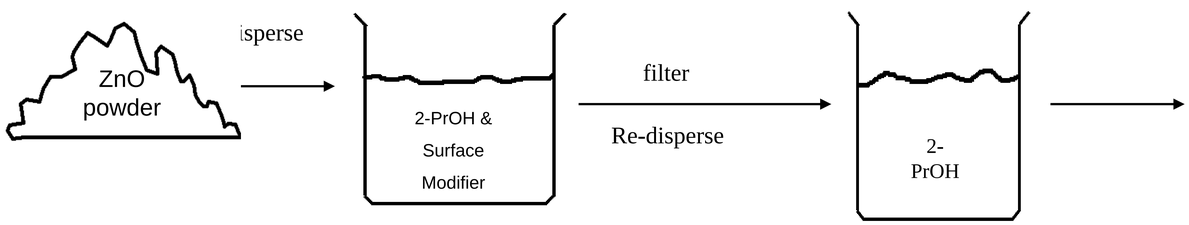


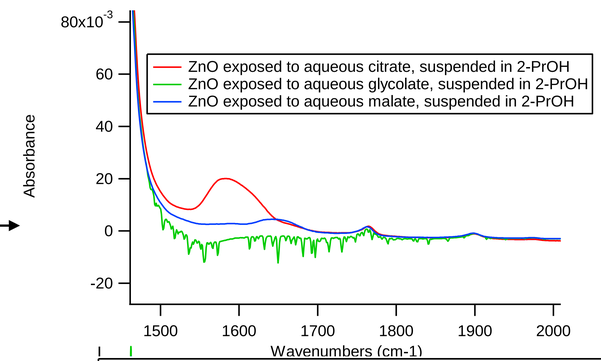
Why Does Citrate Bind to the Crystal Surfaces?

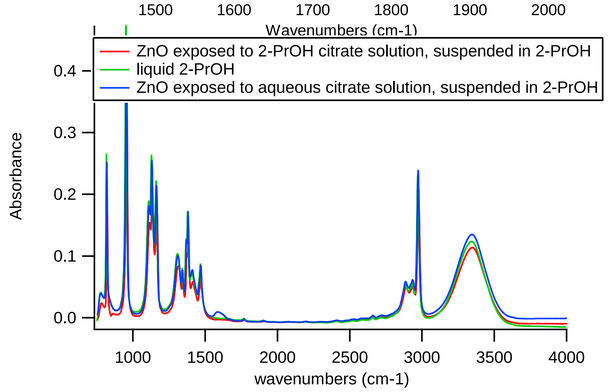
Binding correlated with the number of carboxyl groups on the modifier



Binding correlated with the surface modifier solvent







Conclusions

In the presence of iso-propanol, carboxyl groups are inhibited from binding to the surface of ZnO, while in the presence of water, this phenomenon is either enabled or enhanced. As the number of carboxyl groups available in the surface modifier increased, the peak associated with the binding of the carboxyl group to the ZnO surface increased in intensity, therefore the more carboxyl groups that a surface modifier has, the more likely it is to bind to the surface of the ZnO.

Acknowledgements

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